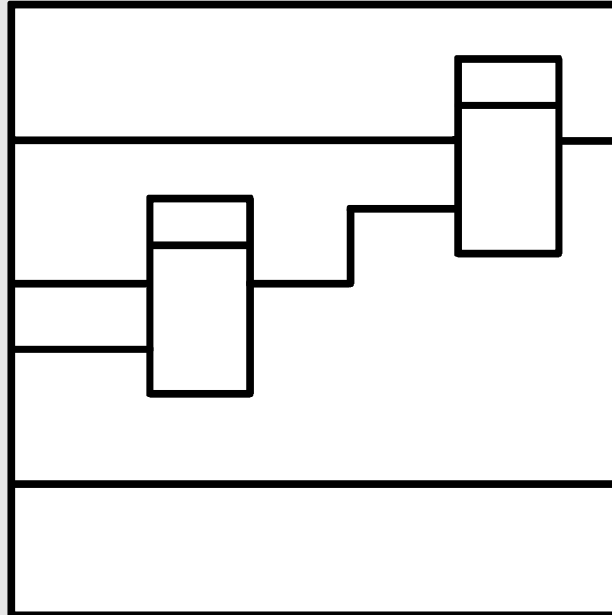


SIMADYN D

Digital Control System

User Manual

Interface module CS51



Edition		Edition status
1	Interface module CS51	10.93
2	Interface module CS51	03.94
3	Interface module CS51	10.94
4	Interface module CS51	05.95

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We have checked the contents of this Manual to ensure that they coincide with the described hardware and software. However, deviations cannot be completely ruled-out, so we cannot guarantee complete conformance. However, the information in this document is regularly checked and the necessary corrections included in subsequent editions. We are thankful for any recommendations or suggestions.

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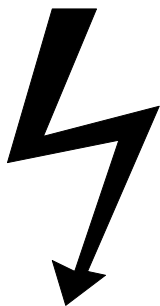
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NOTE !

The information in this Manual does not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, please contact your local Siemens office.

Further, the contents of this Manual shall not become a part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties nor modify the existing warranty.

Warning information**WARNING !**

Electrical equipment has components which are at dangerous voltage levels.

If these instructions are not strictly adhered to, severe bodily injury and material damage can result.

Only appropriately qualified personnel may work on this equipment or in its vicinity.

This personnel must be completely knowledgeable about all the warnings and service measures according to this User Manual.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

Definitions

* **QUALIFIED PERSONNEL**

For the purpose of this User Manual and product labels, a „Qualified person“ is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid.

* **DANGER**

For the purpose of this User Manual and product labels, „Danger“ indicates death, severe personal injury and/or substantial property damage will result if proper precautions are not taken.

* **WARNING**


For the purpose of this User Manual and product labels, „Warning“ indicates death, severe personal injury or property damage can result if proper precautions are not taken.


* **CAUTION**

For the purpose of this User Manual and product labels, „Caution“ indicates that minor personal injury or material damage can result if proper precautions are not taken.

* **NOTE**

For the purpose of this User Manual, „Note“ indicates information about the product or the respective part of the User Manual which is essential to highlight.

	<table><tr><th data-bbox="488 1041 1388 1146">CAUTION!</th></tr><tr><td data-bbox="488 1146 1388 1319"><p>This board contains components which can be destroyed by electrostatic discharge. Prior to touching any electronics board, your body must be electrically discharged. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cabinet components, socket protective conductor contact).</p></td></tr></table>	CAUTION!	<p>This board contains components which can be destroyed by electrostatic discharge. Prior to touching any electronics board, your body must be electrically discharged. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cabinet components, socket protective conductor contact).</p>
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	<table><tr><th data-bbox="488 1408 1388 1516">WARNING!</th></tr><tr><td data-bbox="488 1516 1388 1774"><p>Hazardous voltages are present in this electrical equipment during operation.</p><p>Non-observance of the safety instructions can result in severe personal injury or property damage.</p><p>It is especially important that the warning information in all of the relevant Operating Instructions are strictly observed.</p></td></tr></table>	WARNING!	<p>Hazardous voltages are present in this electrical equipment during operation.</p> <p>Non-observance of the safety instructions can result in severe personal injury or property damage.</p> <p>It is especially important that the warning information in all of the relevant Operating Instructions are strictly observed.</p>
WARNING!			
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1. Ordering data

CS51: 6DD1660-0AH1

Communications module CS51

2. Description

The CS51 module is used to connect a SIMOVERT P 6SE12 or SIMOREG K 6RA24 to a higher level automation, control or monitoring system. The interface uses one of the following protocols:

- USS protocol
- SINEC L2 DP
- SINEC L2 FMS
- Simple (point to point)
- SINEC L1
- 3964R (data transmission procedure without RK512 or pre-header)
- Simple (via a bus)
- DUST6

Any of these protocols can be selected. This is described in the publication 'Datenaustausch zwischen SIMOREG K/SIMOVERT P - Geräten und Erweiterungsbaugruppen (Gerätreaktion)', [*Data transfer between SIMOREG K/SIMOVERT P units and expansion modules (units' response)*] order number 6DD1902-0GE0.

The module has three serial interfaces plus a parallel interface for connecting a 6SE12 / 6RA24 basic module or PT1/PT10 technology board. The exchange of data between the CS51 and the basic module / technology board takes place via a Dual Port RAM.

Incoming and outgoing telegrams are processed by a NEC uPD70325 (V25plus) processor. The firmware is held in EPROM.

3. Module design

3.1. Mechanical aspects

The interface module is 160 x 233.4 mm in size and occupies the first slot in the rack, where it is screwed into place.

The modules are connected together using ribbon cables as described below:

Basic module <--> PT1/PT10 <--> CS51

Basic module <--> CS51 (no technology board)

A separate +24V power supply is required if a full CS51 configuration is being used.

3.2. HW configuration

The module comprises the following hardware components.

- NEC uPD70325 (V25plus) processor
- 128 kbyte EPROM with firmware
- 128 kbyte RAM
- 2 kbyte Dual Port RAM
- Watchdog monitor for Dual Port RAM
- 3 serial interfaces (RS485, TTY, RS 232)
- 1 parallel interface

3.3. Function of the processor

The uPD70325 (V25plus) processor is responsible for processing the data that passes between the compact unit (basic unit and expansion modules) and the higher-level system. Data can be received at any time. After it has been processed it is written to the Dual Port RAM. Data is only sent in response to a request from the higher-level system.

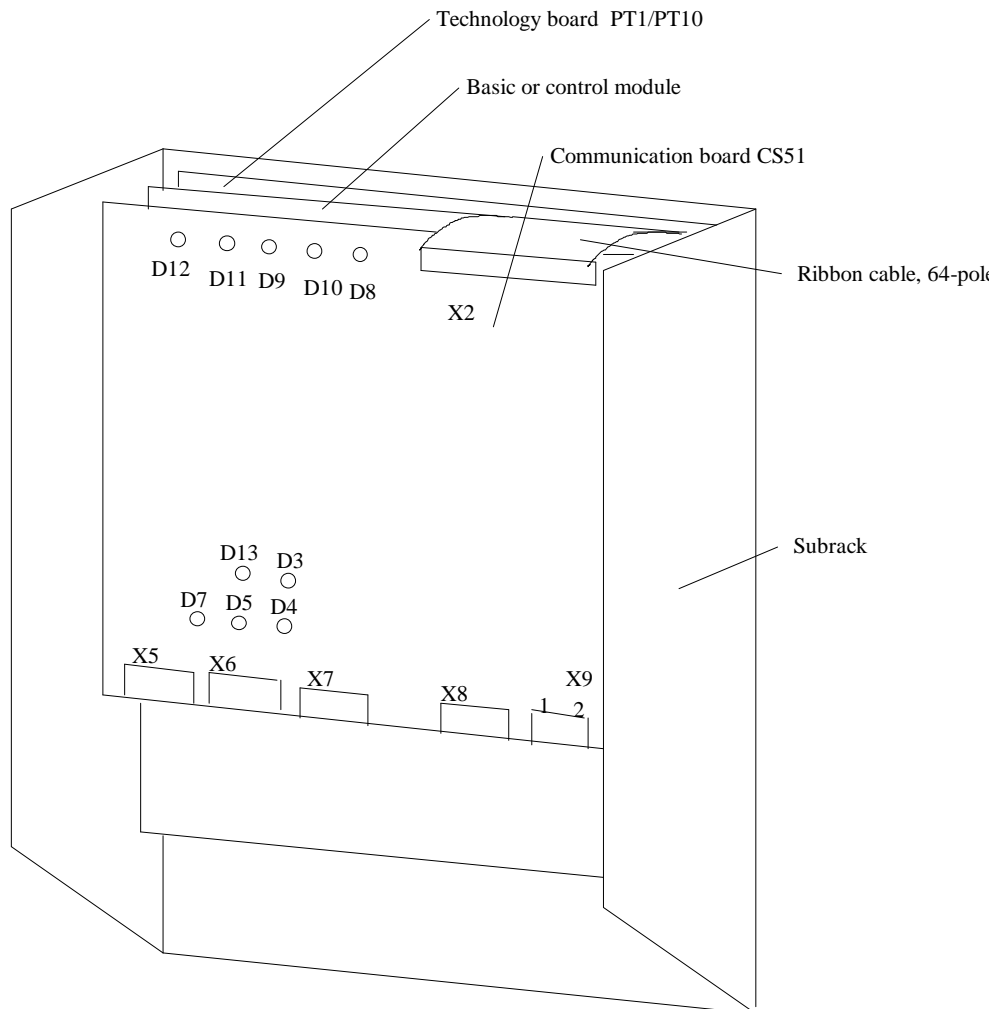


Figure 1: Subrack layout

4. Interfaces

4.1. Parallel interface

The parallel bus is connected to interface X1 of the technology board (PT1/PT10) by the 64-pole ribbon cable in slot X2. If a technology board is not present, the bus is connected to interface X100 of the 6SE12 control module or interface X100 in the case of the 6RA24. In addition to carrying the data, address and control buses, this interface also provides a power supply of +5V, +15V and -15V.

4.2. Serial interfaces

The module has three serial interfaces:

2 * RS485
RS232 (V.24) / TTY (20mA)

4.2.1. RS485 (SST1 interface)

There are two separate RS485 interfaces:

Connectors X5 and X6 are used to connect the DUST6 bus; for the connection to the SINEC L2 bus, X7 is used.

These interfaces support the following protocols:

Protocol	Transmission rate	Plug
USS	300Bd - 38.4 kBd	X5, (X6)
SINEC L2 DP	max. 1.5 MBd	X7
SINEC L2 FMS	max. 1.5 MBd	X7
DUST6	117.6 kBd	X5, X6
Simple protocol (via a bus)	4.8 kBd - 38.4 kBd	X5, (X6)

The RS485 interfaces are isolated, with an external +24 V power supply provided on X9.

Please note

Only one protocol may be used at a time.

4.2.2. TTY (20mA) / RS 232 (V.24) (SST2 interface)

The TTY (20mA) and RS 232 (V.24) interfaces are situated in the 15-pole Sub-D connector X8.

Please note	
Only one interface may be used at a time, either RS 232 (V.24) or TTY (20mA).	
Only one protocol may be used at a time	

These interfaces support the following protocols:

Protocol	Transmission rate	Physical interface
USS	300 Bd - 38.4 kBd	TTY, RS232
SINEC L1	9.6 kBd	TTY *)
Simple protocol (point to point)	1.2 kBd - 19.2 kBd	TTY, RS232
3964R	9.6 kBd	TTY, RS232

*) As this protocol uses the BT777 bus terminal, only the TTY interface is supported.

4.2.2.1. TTY (20mA)

There are two non-isolated current sources for the TTY interface. The transmitter and the receiver are isolated. The maximum cable length is 100m at 19.2 kBd. A 4 core round screened cable should be used (e.g. LICYC, 4 * 0.5, from. Metrofunk).

4.2.2.2. RS232 (V.24)

The RS 232 interface is not isolated. To drive the RS 232 interface, two wire jumpers must be soldered in place in the plug housing.

Jumper 1:	Pin 2 -- Pin 15
Jumper 2:	Pin 9 -- Pin 11

The maximum cable length is 15m at 19.2 kBd. A 4 core round screened cable should be used (e.g. LICYC, 4 * 0.5, from. Metrofunk).

5. Installing the bus system

5.1. USS protocol

Two-wire cable:

The bus is installed using a two-wire cable as illustrated below:

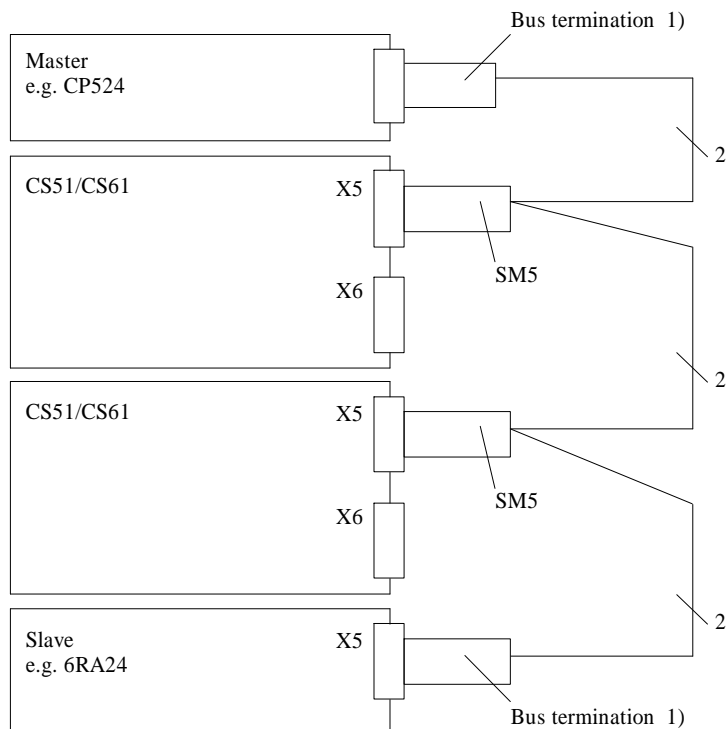


Figure 1: Installation of two-wire bus

- 1) A bus termination must be present on the first and last node in the bus line.
The connection of the two-wire cable to plug X5 of the CS51 module is carried out as shown in the diagram below:

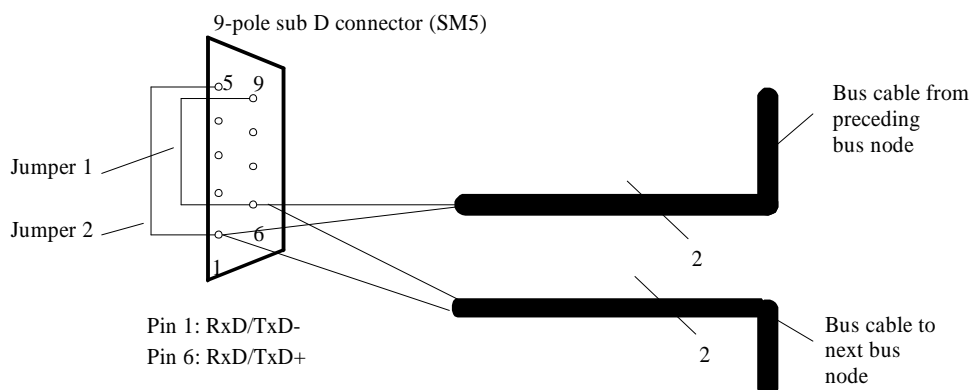


Figure 2: Pin-out for connecting two-wire cable to plug X5

Note

Two wire jumpers must be soldered in the plug

Jumper 1: Pin 6 -- Pin 9

Jumper 2: Pin 1 -- Pin 5

5.1.1. Bus termination for USS protocol on CS51

If the CS51 module is the first or last node on the bus line, a bus termination must be fitted in plug S5 or S6 as shown below.

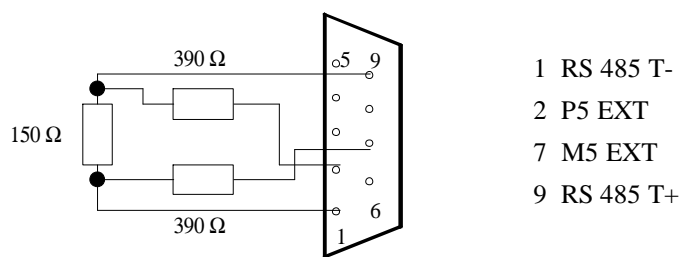


Figure 3: Bus termination for USS protocol

5.2. SINEC L2 DP, SINEC L2 FMS

Connection is made either via the SINEC L2 RS485 bus terminal or the SINEC L2 bus connection plug to the 9-pole Sub D connector X7. When using the RS485 bus terminal, the capacitance of the drop cable must be taken into account in relation to the Baud rate. Both the bus terminal and the bus connection plug have terminating resistors that can be connected.

Notes on SINEC L2 and the components necessary to install a bus system can be found in the SIMATIC S5 catalogue "Nachtrag April 1992 zum Katalog ST52.1" or the equipment manual "SIMATIC S5 Dezentrales Peripheriesystem ET200", order number: 6SE5998- 3ET11.

Note:

The CS51 is a slave interface on SINEC L2 DP and SINEC L2 FMS.

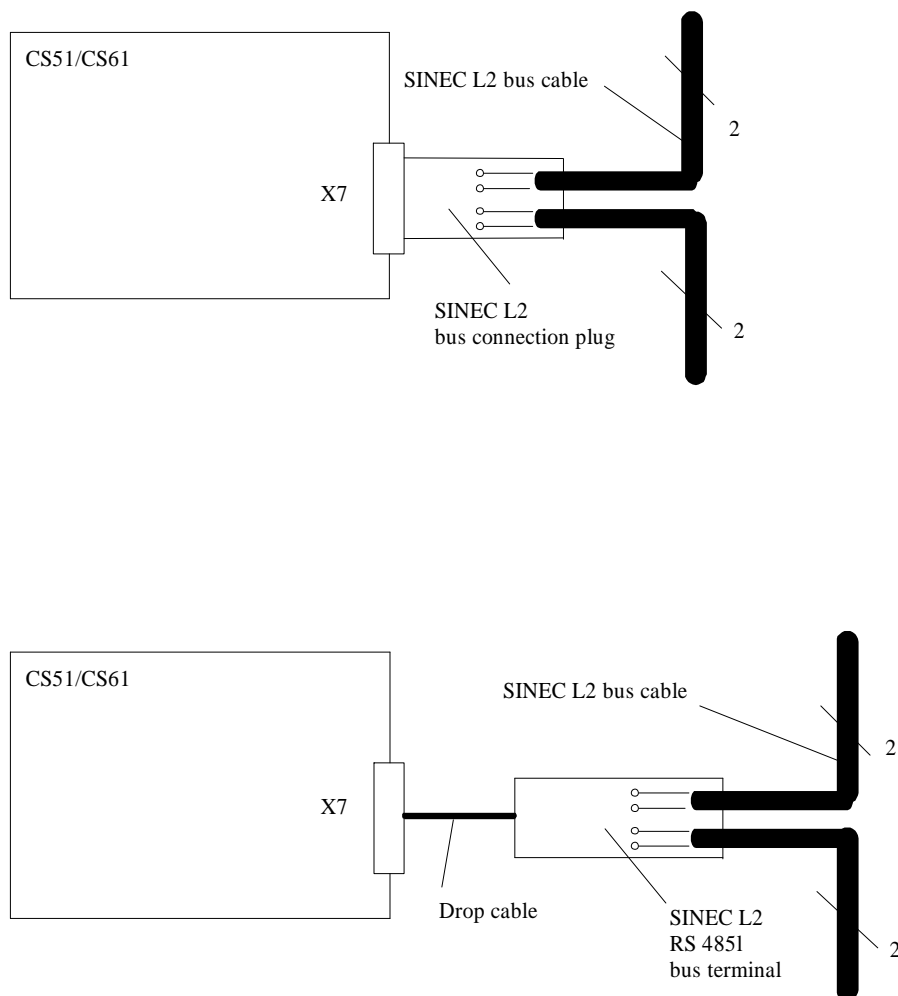


Figure 4: Connection to SINEC L2 bus via SINEC L2 bus connection plug and RS 485 bus terminal

5.3. DUST6 bus

The cable to the CS41 or the previous node on the bus is connected to the 9-pole Sub-D connector X5. The cable to the next node on the bus is connected to X6. The previous node on the bus may be either a CS51 module situated in a compact unit, a CS61 module in a SIMOVERT A4/P3 or a CS41 master module in the SIMADYN D rack. The next node may also be a CS51 module in a compact unit or a CS61 module in a SIMOVERT A4/P3. An SM7 bus terminator must be fitted to connector X6 of the last node on the bus.

The cables connecting the CS41 and CS51 or the CS51 to another CS51 or a CS61 must be made up to the correct length. The pin-out and the type of cable for installing the DUST6 bus can be found in the publication "Kommunikationsmodul CS41, Anschluß von DUST6 und ET100U, Projektierungshilfe" [*Communications modules CS41, connection of DUST6 and ET100U, Planning guidelines*], order number E31930-T8005-X-A1.

One each of parts kits SM1.1 and SM5 are required for the connection cable between CS41 and CS51, and one each of parts kits SM5 and SM5.1 for the connection cable between CS51 and CS51 or CS61.

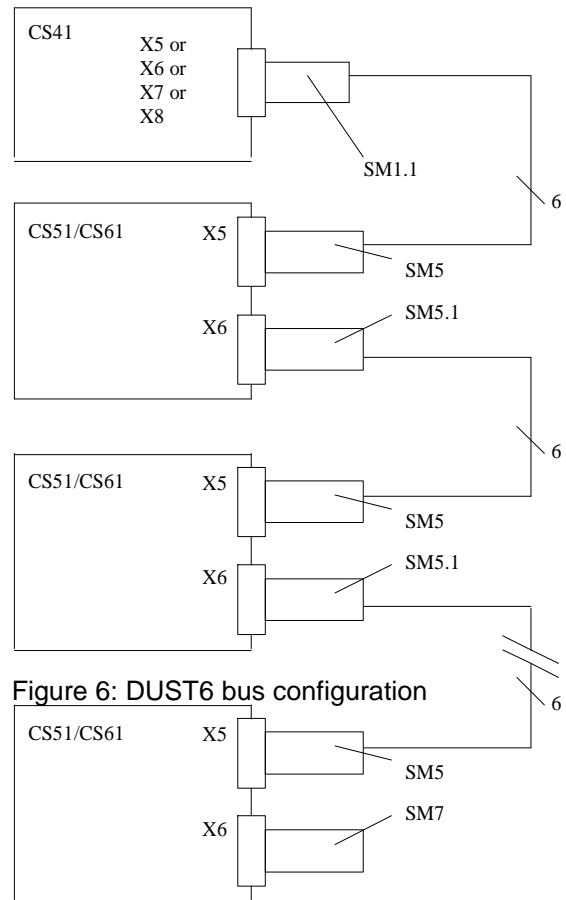


Figure 6: DUST6 bus configuration

As an alternative to the SM7 bus connection plug, two 120Ω terminating resistors can be soldered directly in the plug housing of plug X5 on the last node. One resistor is soldered between pins 1 and 9, the other between pins 5 and 6.

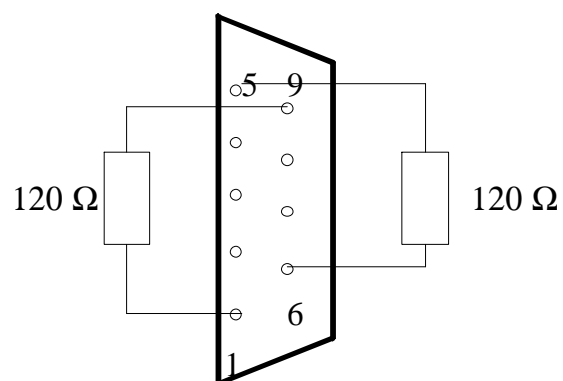


Figure 7: Connection of bus terminating resistors

5.4. SINEC L1

Modules are connected to the bus through the SINEC L1 bus terminal BT777, which fits into the 15-pole Sub-D connector X8. To enjoy all the features of the bus terminal, an external power supply is required (P5EXT). See the technical description of the BT777 bus terminal for more information.

To connect the SINEC L1 bus terminal BT777, both threaded pins on plug X8 must be replaced by the interlocking pins supplied.

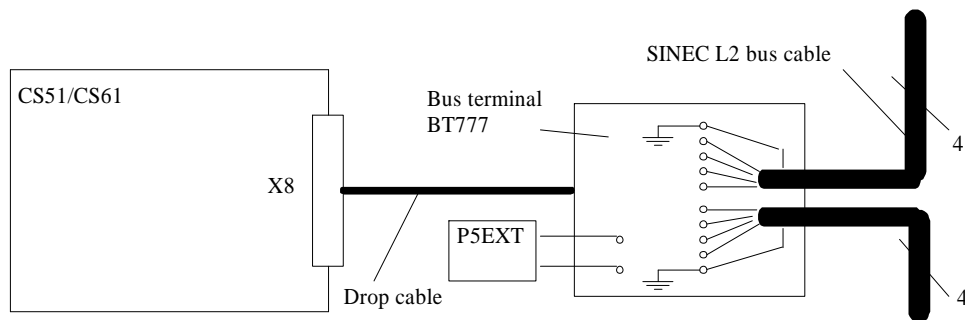


Figure 8: Connection to the SINEC L1 bus using the bus terminal

5.5. Simple protocol (via a bus)

Four-wire cable

The bus has the same configuration and the same pin-out on plugs X5 and X6 as for the DUST6 bus.

Two-wire cable

The configuration of the bus and the bus terminations with a two-wire cable, as well as the pin-outs on plug X5, are the same as for the USS protocol.

6. Installation guidelines

The following installation guidelines must be observed to ensure trouble-free operation of the serial bus:

A potential equalisation conductor (min. 16 mm²) must be laid between the individual nodes. This conductor must be connected to all the earth bars.

The screen of the bus cable must be well earthed as close as possible to the connector.

The SIMADYN D installation guidelines and the EMC guidelines must also be observed.

7. LEDs

The LEDs D3, D4, D5 and D13 show whether data traffic is present on the serial send and receive conductors of the RS485 and 20mA / V.24 interfaces.

LED	Status	Meaning	Remarks
D3	off / on flickering / glowing	RS485 interface not sending RS485 interface sending	applies to X5, X6 and X7
D13	off / on flickering / glowing	RS485 interface not receiving RS485 interface receiving	
D5	off / on flickering / glowing	RS232 / TTY interface not sending RS232 / TTY interface sending	applies to X8
D4	off / on flickering / glowing	RS232 / TTY interface not receiving RS232 / TTY interface receiving	

LEDs D8 - D12 act as check indicators for the operating status of the processor and the specified protocols.

LED	Status	Meaning	Remarks
D12	off, flickering on	Transmission error in USS protocol on SST2 USS running error-free on SST2	applies to X8
D11	off, flickering on	Transmission error in DUST6- or USS protocol (RS485) on SST1 DUST6- or USS protocol (RS485) running error-free on SST1	applies to X5 and X6
D9	off, flickering on	Transmission error in SINEL L1 protocol SINEC L1 protocol running error-free	applies to X8
D8	off, flickering on	Transmission error in SINEC L2 protocol SINEC L2 protocol running error-free	applies to X7
D10	off, on flashing	Processor fault Processor running	

LED D7 has no function.

8. Additional components

The following additional components are required when configuring the bus for DUST6, USS and simple protocol on the RS 485 interface (see Catalogue DA99, October 1990 supplement):

Description	MLFB
Parts kit SM1.1	6DD1680-0AB1
Parts kit SM5	6DD1280-0AF0
Parts kit SM5.1	6DD1680-0AF1
Bus terminator SM7 (DUST 6)	6DD1680-0AH0

The following additional components are required for a SINEC L2 bus:

Description	MLFB
Bus terminal RS485, 1.5 m cable	6GK1500-0AA00
Bus terminal RS485, 3 m cable	6GK1500-0AB00
SINEC L2 bus connector	e.g. 6ES5762-1AA12

Refer to the catalogues 'SINEC Industrial Communications Networks Catalog IK 10.1993' and 'ET200 and ET100U Distributed I/O Systems Catalog ST54.2' for other components for the SINEC L2 bus.

The following additional components are required for a SINEC L1 bus:

Description	MLFB
Bus terminal BT777-0 (1 m cable)	6ES5777-0BB00
Bus terminal BT777-1 (2 m cable)	6ES5777-1BC00

9. Technical data

Insulation group	A according to VDE 0110 § 13 Group 2 at 24 V-, 15 V-, 5 V-	
Ambient temperature	0 to +55 ° C with self-ventilation	
Storage temperature	-40 to + 70 ° C	
Humidity rating	F according to DIN 40040	
Altitude rating	S according to DIN 40040	
Mechanical duty	Installed in static units that may vibrate	
Enclosure systems	MKT swing-out rack	
Dimensions	160 * 233.4 mm	
Module width	1 slot in MKT rack	
Weight	0.4 kg	
Power consumption	P5	0.5 A
	P15	50 mA
	P24 external	100 mA

10. Interface pin assignments

10.1. Pin-outs of the RS 485 interfaces X5, X6

X5 (9-pole, Sub-D female connector), X6 (9-pole, Sub-D male connector)

1	RS485T-	Send signal -
2	P5EXT	5V external
3	M5EXT	External ground
4	M5EXT	External ground
5	RS485R-	Receive signal -
6	RS485R+	Receive signal +
7	M5EXT	External ground
8	M5EXT	External ground
9	RS485T+	Send signal +

10.2. Pin-outs of the RS 485 interface X7

X7 (9-pole, Sub-D female connector)

1	---	---
2	---	---
3	PRFTR +	Receive and send signal +
4	RTS	Ready to send
5	M5EXT	External ground
6	P5EXT	5V external
7	---	---
8	PRFTR -	Receive and send signal -
9	RTS	Ready to send

10.3. Pin-outs of the RS 232 / TTY interface X8

X8 (15-pole, Sub-D female connector)

Pin	TTY (20mA)	RS 232 (V.24)
1	---	---
2	RTTY- (Current loop Receive -)	Jumper to pin 15
3	---	---
4	---	RXD (Receive signal RS 232)
5	M (Earth)	M (Earth)
6	TTTY+ (Current loop Send +)	---
7	TTTY- (Current loop Send -)	---
8	---	---
9	RTTY+ (Current loop Receive +)	Jumper to pin 11
10		TXD (Send signal RS 232)
11	20mA1 (Current source 1)	Jumper to pin 9
12	M (Earth)	M (Earth)
13	20mA2 (Current source 2)	---
14	---	---
15	M (Earth)	Jumper to pin 2

10.4. Parallel interface X2 to the PT1/PT10 or the basic unit

X2 (64-pole ribbon cable to PT1/PT10 or basic unit/control module)

Pin	Function	Pin	Function
1	AD0	2	M
3	AD1	4	M
5	AD2	6	M
7	AD3	8	M
9	AD4	10	M
11	AD5	12	M
13	AD6	14	M
15	AD7	16	M
17	AD8	18	M
19	AD9	20	M
21	AD10	22	M
23	AD11	24	M
25	AD12	26	M
27	AD13	28	M
29	AD14	30	M
31	AD15	32	M
33	ALE	34	ME
35	L_WR	36	ME
37	L_RESET	38	ME
39	L_RD	40	ME
41	L_READY	42	ME
43	L_BHE	44	ME
45	---	46	ME
47	SYNC	48	ME
49	ME	50	---
51	---	52	L_CSPER1
53	---	54	L_INT
55	ME	56	L_STAT1E
57	---	58	---
59	P5	60	---
61	P5	62	P15
63	P5	64	N15

10.5. Block diagram

Figure 9: Block diagram

10.6. Dimensional drawing and table showing connectors

Figure 10: Dimensional drawing and table showing connectors used

10.7. Location diagram

Figure 11: Location diagram

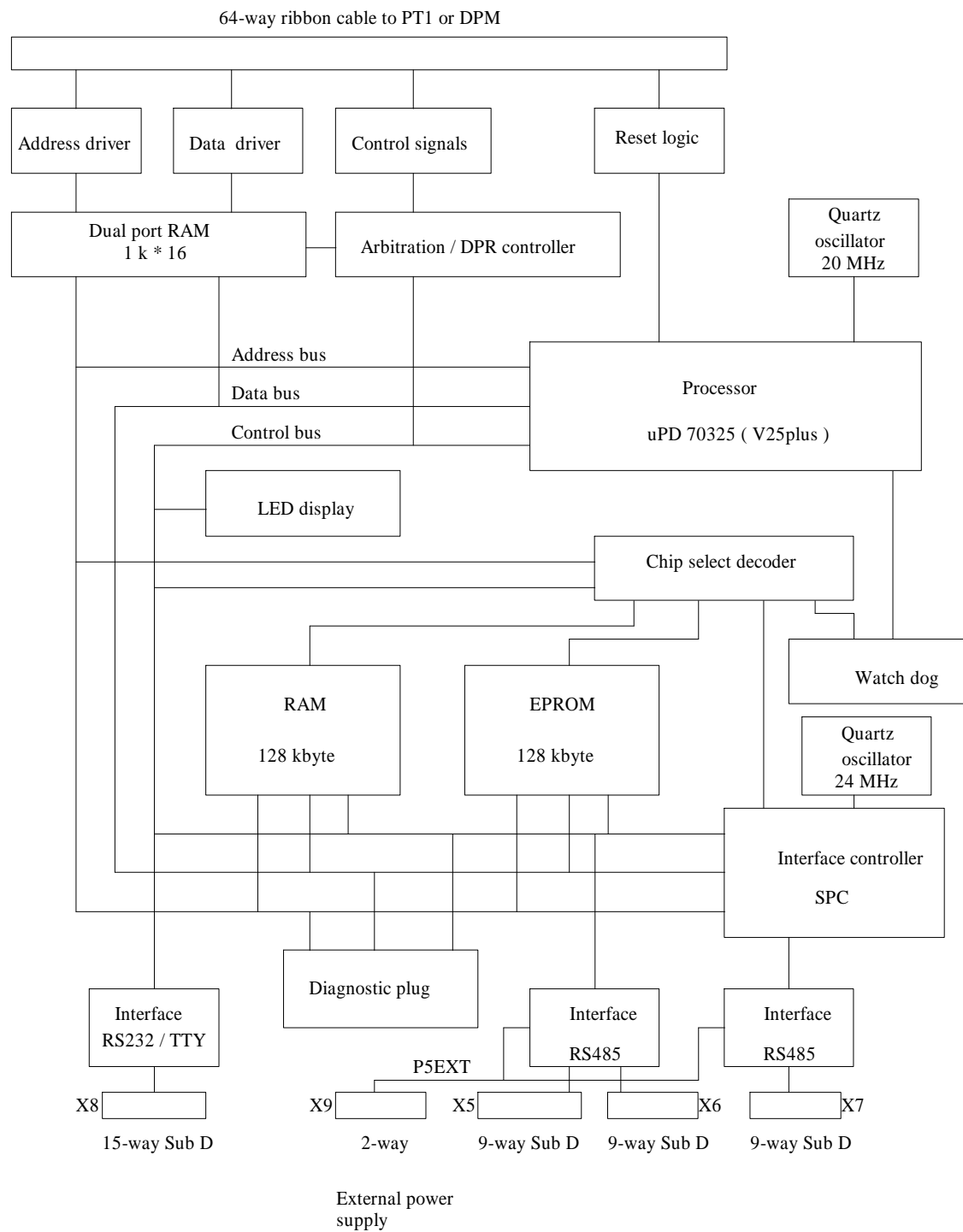
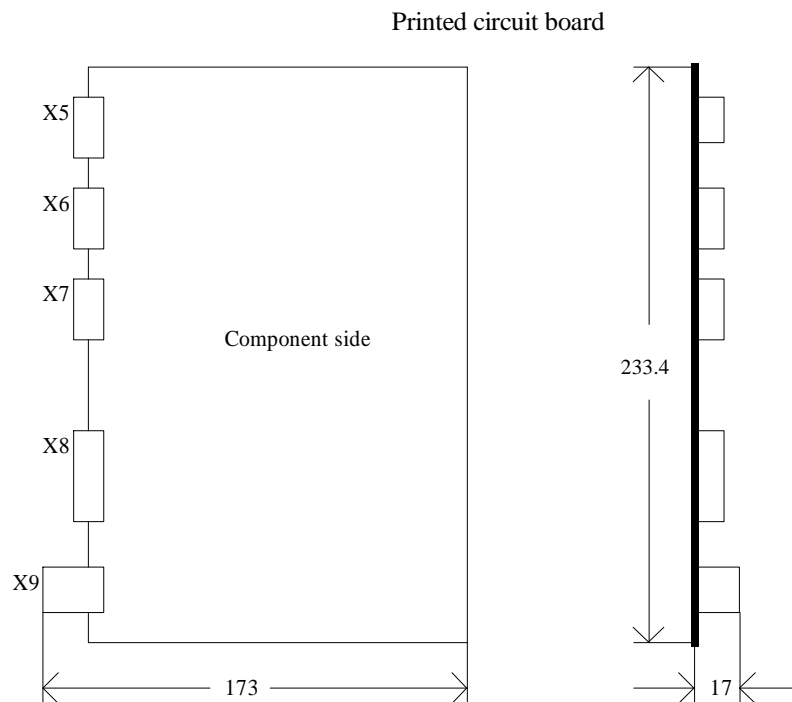


Figure 9: Block diagram



Connector	Name	Type (standard)	Function
X5	Socket connector 9-way	B009FS-C1D1S DIN 41652	Serial interface RS485
X6	Plug connector 9-way	B009MS-C1D1S DIN 41652	Serial interface RS485
X7	Socket connector 9-way	B009FS-C1D1S DIN 41652	Serial interface RS485
X8	Socket connector 15-way	B015FS-C1D1S DIN 41652	Serial interface RS232/TTY
X9	Plug connector 2-way	MSTBA 2,5/2-G-5,08 (Phoenix)	24 V - external

Figure 10: Dimension drawing and table showing connectors used

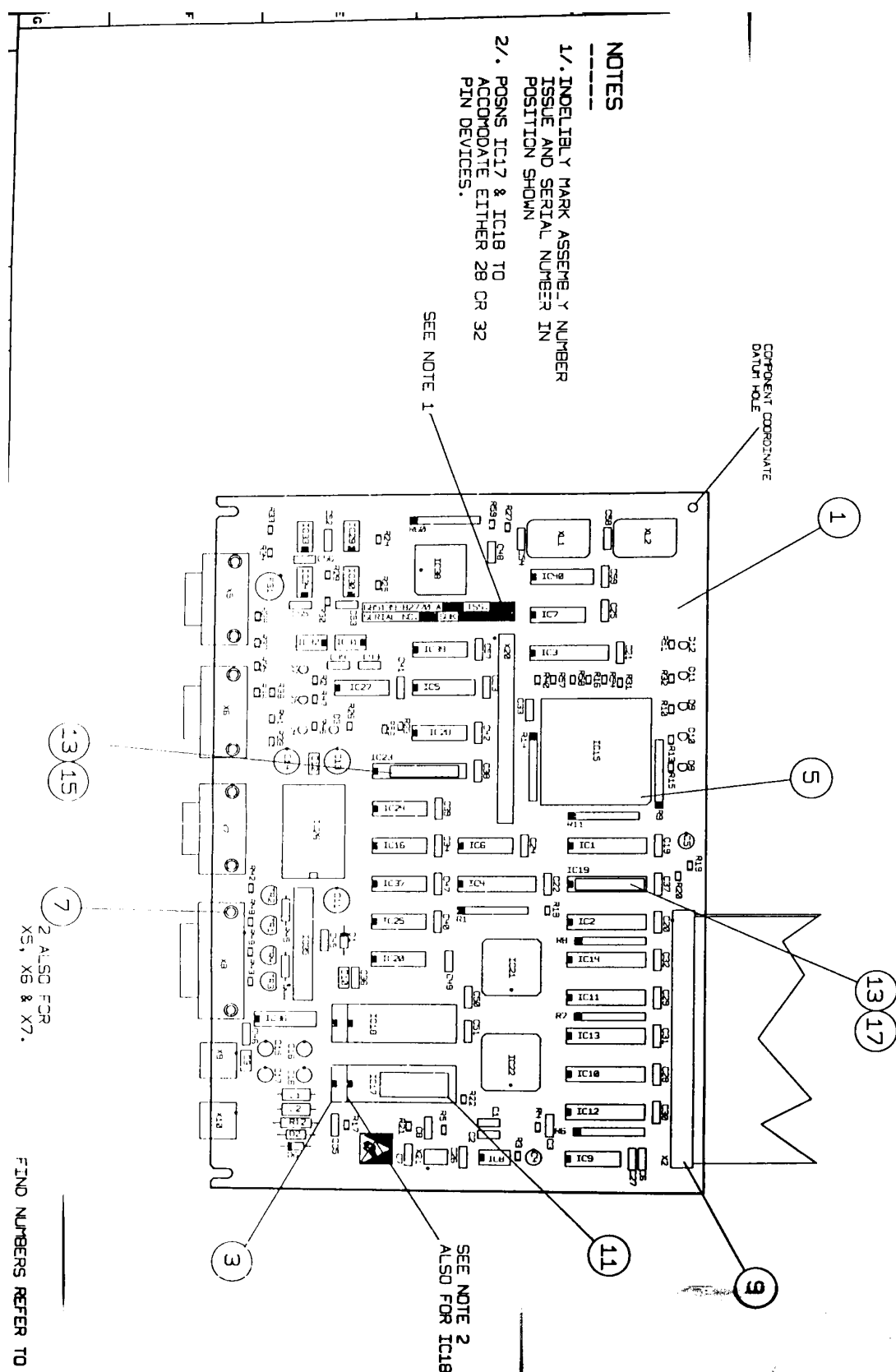


Figure 11: Location diagram

11. ECB instructions

Components which can be destroyed by electrostatic discharge (ECB)

Generally, electronic boards should only be touched when absolutely necessary.

The human body must be electrically discharged before touching an electronic board. This can be simply done by touching a conductive, grounded object directly beforehand (e.g. bare metal cubicle components, socket outlet protective conductor contact).

Boards must not come into contact with highly-insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers.

Boards must only be placed on conductive surfaces.

When soldering, the soldering iron tip must be grounded.

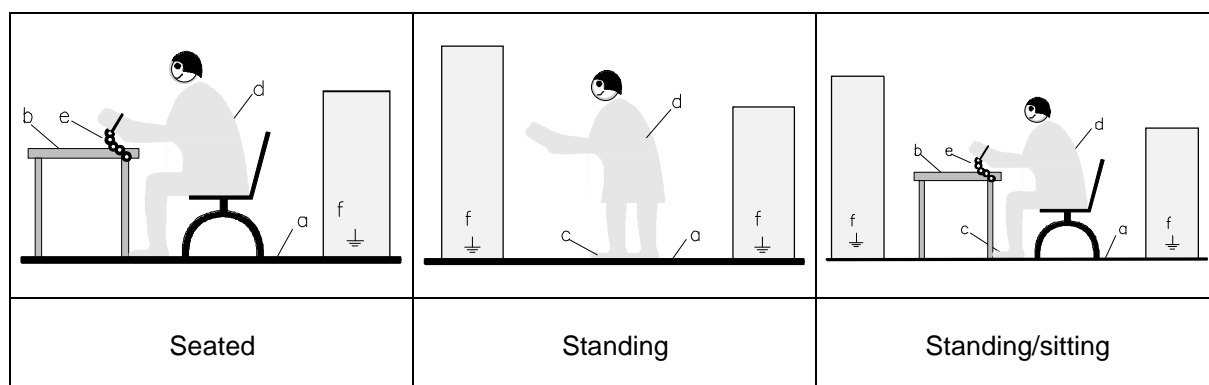
Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes, metal containers).

If the packing material is not conductive, the boards must be wrapped with a conductive packing material, e.g. conductive foam rubber or household aluminum foil.

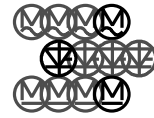
The necessary ECB protective measures are clearly shown in the following diagram.

a = Conductive floor surface
b = ECB table
c = ECB shoes

d = ECB overall
e = ECB chain
f = Cubicle ground connection



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